Project title: Palmod-KIT

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Keywords: Regionalisation of global paleoclimate simulations, regional ice sheet modeling, regional water isotope modeling, validation, proxy data

Abstract

This project comprises two tasks which contribute to the work packages "Physical System (WG1)" and "Synthesis and Analysis of Proxy Data (WP3)" of the BMBF joint project "From the Last Interglacial to the Anthropocene: Modeling a Complete Glacial Cycle (PalMod)". The aim of this project is to understand climate system dynamics and variability during the last glacial cycle. Specific topics are: i) to identify and quantify the relative contributions of the fundamental processes which determined the Earth's climate trajectory and variability during the last glacial cycle, ii) to simulate with comprehensive Earth System Models (ESMs) the climate from the peak of the last interglacial (the Eemian warm period) up to the present, including the changes in the spectrum of variability, and iii) to assess possible future climate trajectories beyond this century during the next millennia with sophisticated ESMs tested in such a way. The large scale/long term simulations are performed with Earth system models (ESMs). To enable resp. facilitate the comparison with proxy data for validation and analysis purposes, the ESM results are downscaled in relevant regions by means of the regional climate model COSMO-CLM. For that purpose, COSMO-CLM will be run with a water isotope module. COSMO-CLM will also be coupled with an ice sheet model to study glaciation and deglaciation on regional scales. Specific details:

Work package WP-1-2 is part of the working group 1 "Physical System". KIT will adapt and set up the regional climate model COSMO-CLM and an adapted land surface module (coupling of the ice sheet model will be via the OASIS coupler) for simulations of the ice sheet areas in order to improve the modeling of processes which are subgrid scale for the global models and eventually to provide suitable parameterisations. This will require present day control and validation simulations as well as paleoclimate simulations (driven by GCM data form project partners) in the ice sheet areas. We will perform test runs (e.g. concerning the size of computation domain, the nesting strategy and the resolution), analyse the sensitivity of the results, validate the control period simulations and assess the added value of higher resolution. Computational requirement estimates are about 80 simulated years at 0.44° (about 100 x 100 grid points) and 0.22° (about 200 x 200 grid points).

Work package WP-3-3 "Data-model interface and data analysis" is part of the working group 3 "Synthesis and Analysis of Proxy Data". In cooperation with ETH Zurich, KIT will implement water isotope modeling in all relevant model components of COSMO-CLM to provide a forward operator facilitating a joint analysis of proxies and simulation results. To evaluate the isotope-enabled forward models, simulations will be carried out for the pre-industrial/present-day climate state and compared to observations. Later on, the model will

be used to analyze paleoclimatic data of selected time periods and regions. Computational requirement estimates are about 80 simulated years at 0.44° (about 100 x 100 grid points) and 0.22° (about 200 x 200 grid points).

Previous experience

We are experienced users of the machines at DKRZ (Blizzard and Mistral within the MiKlip project).

Resources for 2016

CPU time: approx. 12000 node-h

Storage: approx. 50 TB

External review

BMBF PalMod project